

APPENDIX E
CLEARANCE CRITERIA

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Clearance Criteria

Right-of-way Clearing Criteria

Bonneville lines are designed and maintained to co-exist in a safe and reasonable manner with anticipated underlying activities, as specified by the National Electrical Safety Code (NESC). In general, the NESC requires tree trimming and removal to prevent “. . . grounding of the circuit through the tree.” The provision in the NESC 1997 Edition is as follows:

**Part 2. Safety Rules for the Installation and Maintenance of
Overhead Electric Supply and Communication Lines**

Section 21. General Requirements

218. Tree Trimming (page 67)

A. General

1. Trees that may interfere with ungrounded supply conductors should be trimmed or removed. Note: Normal tree growth, the combined movement of trees and conductors under adverse weather conditions, voltage, and sagging conductor at elevated temperatures are among the factors to be considered in determining the extent of trimming required.
2. Where trimming or removal is not practical, the conductor should be separated from the tree with suitable materials or devices to avoid conductor damage by abrasion and grounding of the circuit through the tree.

- B. At Line Crossings, Railroad Crossings, and Limited-Access Highway Crossings, the crossing span and the adjoining span on each side of the crossing should be kept free from overhanging or decayed trees or limbs that otherwise might fall into the line.**

In *general*, Bonneville does not allow anything higher than 14 feet (assumed truck height) under the lines (there are some situations under special permit or depending on actual conductor heights that allow for higher allowances). Therefore, Bonneville trims or removes from

under the line any “grow into” trees that are more than 14 feet tall (including future growth) or any “fall into” trees that are next to the line and that are unstable and could fall into the line if they were to topple over.

Additional codes that Bonneville follows are from the Occupational Safety and Health Administration (OSHA). These are codes to maintain safe working environments for workers.

CFR Ch. XVII (7-1-95 Edition) OSHA §1910.333

(i) *Unqualified persons.*

(A) When an unqualified person is working in an elevated position near overhead lines, the location shall be such that the person and the longest conductive object he or she may contact cannot come closer to any unguarded, energized overhead line than the following distances:

- (1) For voltages to ground 50kV or below – 10 ft (305 cm);
- (2) For voltages to ground over 50kV – 10 ft (305 cm) plus 4 in. (10 cm) for every 10kV over 50kV.

(B) When an unqualified person is working on the ground in the vicinity of overhead lines, the person may not bring any conductive object closer to unguarded, energized overhead lines than the distances given in paragraph (c)(3)(i)(A) of this section.

NOTE: For voltages normally encountered with overhead power lines, objects which do not have an insulating rating for the voltage involved are considered to be conductive.

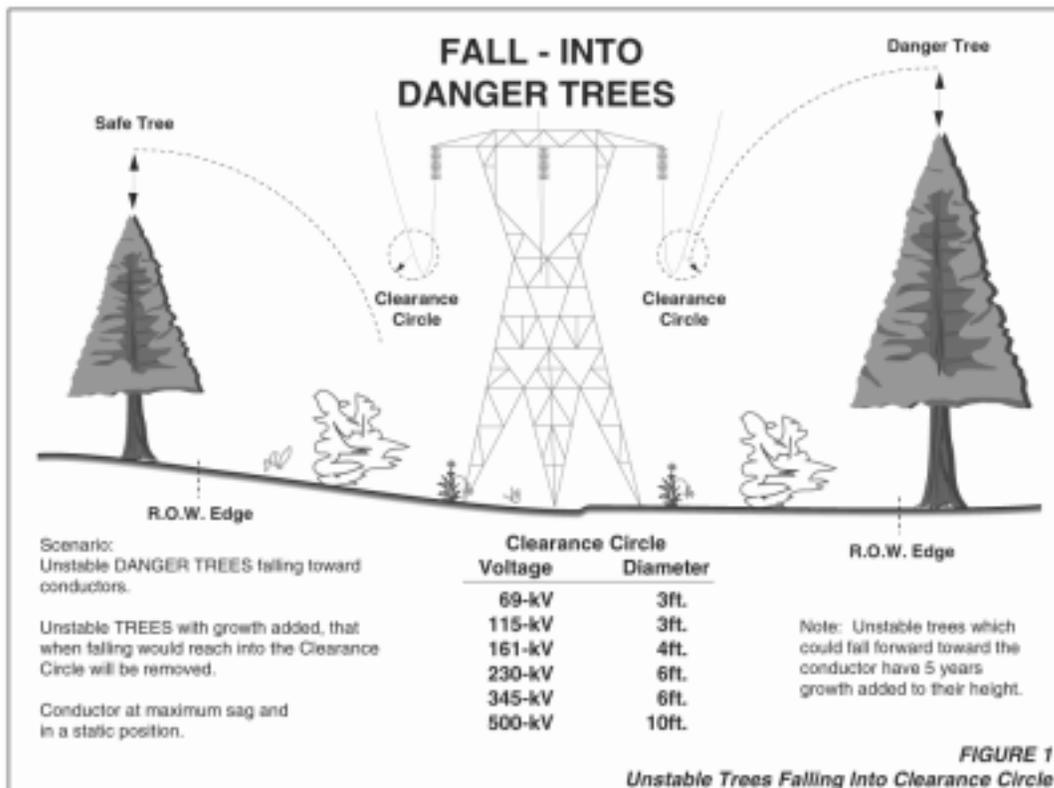
(ii) *Qualified persons.* When a qualified person is working in the vicinity of overhead lines, whether in an elevated position or on the ground, the person may not approach or take any conductive object without an approved insulating handle closer to exposed energized parts than shown in Table S-5 unless:

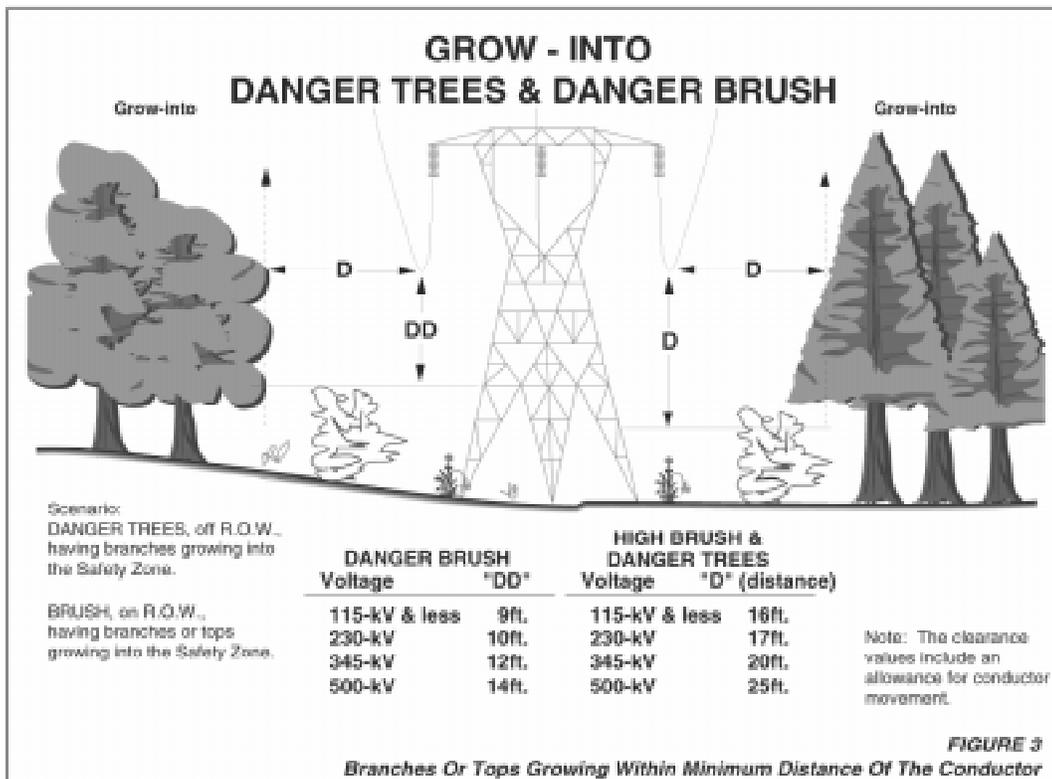
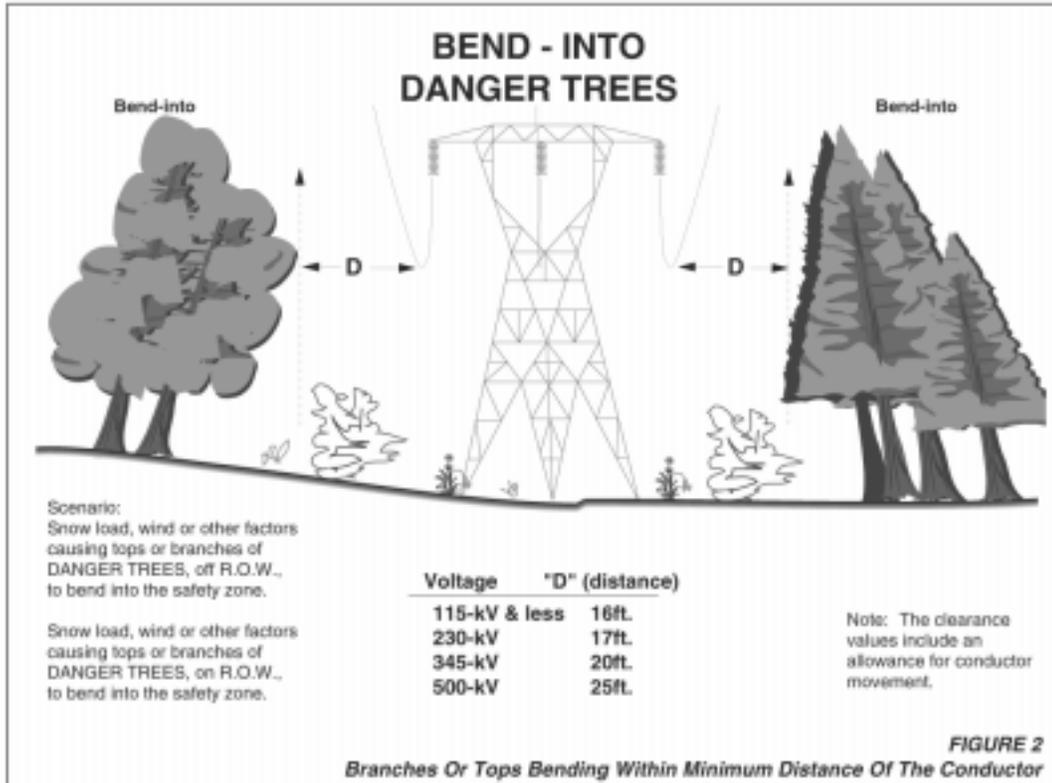
- (A) The person is insulated from the energized part (gloves, with sleeves if necessary, rated for the voltage involved are considered to be insulation of the person from the energized part on which work is performed) or
- (B) The energized part is insulated both from all other conductive objects at a different potential and from the person, or
- (C) The person is insulated from all conductive objects at a potential different from that of the energized part.

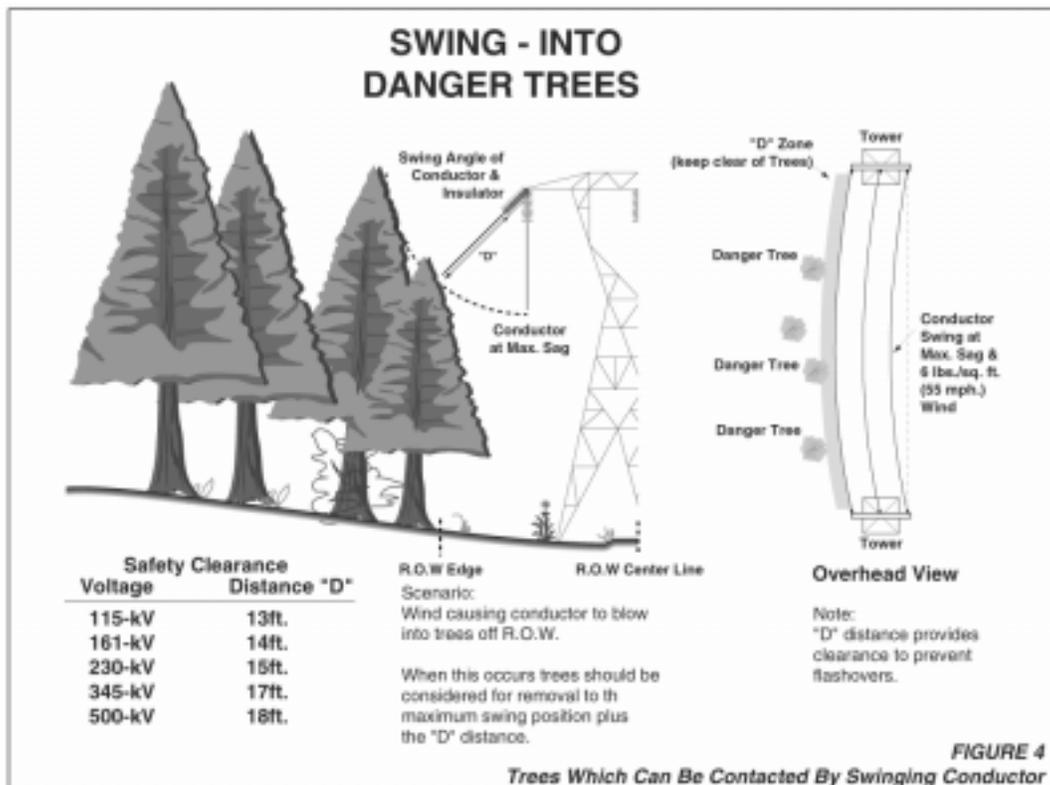
Table S-5 – Approach Distances for Qualified Employees – Alternating Current

Voltage range (phase to phase)	OSHA minimum approach distance (MAD)
300V and less	avoid contact
Over 300V, not over 750V	1ft 0in. (30.5 cm)
Over 750V, not over 2kV	1 ft. 6 in. (46 cm)
Over 2kV, not over 15kV	2 ft. 0 in. (61 cm)
Over 15kV, not over 37kV	3 ft. 0 in. (91 cm)
Over 37kV, not over 87.5kV	3 ft. 6 in. (107 cm)
Over 87.5kV, not over 121kV	4 ft. 0 in. (122 cm)
Over 121kV, not over 140kV	4 ft. 6 in. (137 cm)

Bonneville has used all of the above information to develop criteria to identify trees that must be removed from rights-of-way, as well as those next to rights-of-way.







Substation Grounds Clearing Criteria

The following is from Safety Restrictions for Vegetation Around Bonneville Substations (M212) Facilities Management Information.

Poorly selected or placed vegetation could create a transferred potential hazard if it is located too close to the substation perimeter fence. Since the steepest ground potential rise gradient is at the substation perimeter grid wire, usually located just beyond the perimeter fence, the greatest step-and-touch potentials exist there as well. Grass, weedy vegetation, or bare soil under a person's feet does not provide protection from these step-and-touch potentials. Also, grass, brush, or weeds growing up through the substation surfacing rock create low impedance pathways that could allow step-and-touch potentials to bypass the rock, creating a safety hazard to workers. Blackberry vines, in particular, are a nuisance because their fast-growing, green branches can span several feet or more, and create a transferred potential hazard, especially if they are in contact with the fence.

It is important, therefore, to be intentional about the selection, placement, and maintenance of vegetation around substation yards. The following criteria are the basis for the procedures outlined below:

1) Vegetation touching the fence does not extend beyond the perimeter grid wire. 2) Green, vining vegetation, like blackberry, does not encroach on the area of steepest potential rise gradient or grow up through substation surfacing rock. 3) When the perimeter grid wire is inside the boundaries of the perimeter fence and perimeter vegetation is touching the fence, the side of the shrub or bush away from the fence should be pruned back as closely as possible to the fence or should be removed manually or chemically.

Existing ornamental trees, bushes and shrubbery outside perimeter fences. For substations where the perimeter grid wire is outside the perimeter fence: 1) prune vegetation on the fence side, back away from the fence at least one foot, or 2) for vegetation growing up against the fence, prune so that growth on the side away from the fence does not extend more than three feet out from the fence.

For substations where the perimeter grid is inside the fence: 1) prune vegetation on the fence side back away from the fence at least one foot, or 2) prune the side away from the fence back as close as possible to the fence, or 3) remove the vegetation completely. Vegetation control is especially important at substations without a perimeter grid conductor outside the fence.

New ornamental trees, bushes and shrubbery. Plant no new vegetation within 10 feet of the substation perimeter fence or building. Don't plant tall, fast-growing bushes and trees where they can grow into overhead power lines. If landscaping outside a substation is necessary, a review of grounding issues by the Substation Grounding Engineer is required before being incorporated into a site.

Substation surfacing rock. Extend the substation surfacing rock at least 4 feet beyond the outside of the perimeter fence, unless some physical boundary, such as a ditch, makes it impracticable.

Grass, weeds, brush and blackberry. Do not permit grass and weeds to grow anywhere in the substation surfacing rock. Do not permit blackberry to grow within 10 feet of the perimeter fence. If chemical application is the method selected to control vegetation, try to use a low-toxicity and non-persistent product. For established or aggressive weed infestations, use a more persistent product or a product known to control specific weeds in order to prevent setting of seed and additional emergent seedlings the following growing season.